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ABSTRACT

A study was conducted to relate the revised Occupation Analysis Inventory (OAI) interest- and need-requirement estimates for a sample of jobs to the interest, need, and satisfaction scores of job incumbents. (The OAI is an instrument containing 622 work elements which are descriptions of work activities and conditions on which jobs and occupations are rated.) The revised set of interest- and need-requirement estimates (predictor variables) was used to derive the requirement estimates for forty-three jobs that had been previously rated on the OAI. The interest, need, and satisfaction scores for job incumbents (criterion variables) were obtained from previous administrations of the Ohio Vocational Interest Survey (OVIS), the Minnesota Importance Questionnaire (MIQ), and the Minnesota Satisfaction Questionnaire (MSQ). Correlations of the predictor variables and criterion variables indicated that the OAI attribute-requirement estimates for jobs possess demonstrated relevance to the interests, needs, and satisfactions of job incumbents. (Appended are a breakdown of the job sample by major census categories and a sample of forty-three jobs with the numbers of incumbents in related jobs completing the OVIS, MIQ, and MSQ.) (Author/EM)

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AFFECTIVE CORRELATES OF SYSTEMATICALLY DERIVED OCCUPATIONAL VARIABLES: A REPEATED STUDY

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CENTER FOR OCCUPATIONAL EDUCATION
North Carolina State University at Raleigh

1975

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J. W. Cunningham, Program Director

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ABSTRACT

Systematically derived interest- and need-requirement (reinforcement) estimates for a sample of jobs were related to the corresponding interest, need, and satisfaction scores of job incumbents. The interest- and need-requirement estimates (predictor variables) were derived through application of a "job-component" procedure using the Occupation Analysis Inventory (OAI), an instrument containing 622 work elements (descriptions of work activities and conditions) on which jobs and occupations are rated. In this study, a revised set of interest- and need-requirement weights for the OAI work elements was used to derive the requirement estimates for 43 jobs that had been previously rated on the OAI. The interest, need, and satisfaction scores for job incumbents (criterion variables) were obtained from previous administrations of the Ohio Vocational Interest Survey, the Minnesota Importance Questionnaire, and the Minnesota Satisfaction Questionnaire. The results of various statistical analyses generally supported the construct validity of the OAI job variables. Four general hypotheses concerning relationships between the job and worker variables were tested, of which three received substantial support; the results pertaining to the remaining hypothesis were explained on an ex post facto basis. The obtained results represent a slight improvement over an earlier study which used a less stable set of attribute-requirement estimates. It was concluded that the OAI attribute-requirement estimates for jobs possess demonstrated relevance to the interests, needs, and satisfactions of job incumbents.

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INTRODUCTION

The present study was part of a long-range effort to develop a quantitative occupational taxonomy applicable to occupationally related education and guidance.

The basic instrument in this taxonomic effort is the Occupation Analysis Inventory (OAI), containing 622 "work elements" (descriptions of different types of work activities and conditions) on which jobs and occupations are rated (Cunningham, Tuttle, Floyd, and Bates, 1971). The OAI work elements were generated within the broad framework of an information processing paradigm (see Figure 1) whose components were subdivided according to selected conceptual frameworks pertaining to human behavior and work technology; the work elements were constructed within the resultant subcategories. The completed instrument represented an attempt to achieve as much specificity (or content loading) in occupational description as possible, while retaining applicability to the entire occupational spectrum. The OAI was thus conceived as ". . , an instrument that falls near a specificity-generality threshold separating general descriptive devices from devices designed for restricted categories of jobs and occupations" (Cunningham et al., 1971, p. 5).

To date, 1414 jobs have been rated on the OAI, and the rating data have been subjected to a series of factor analyses which have reduced the 622 OAI work elements to a lesser number of work dimensions, or factors (Riccobono and Cunningham, 1971a, 1971b; Boese and Cunningham, 1975). In the last factor analytic study, eight separate a priori sections of OAI work elements were subjected to factor analyses which yielded a total of 132 rather specific first-order factors, or work

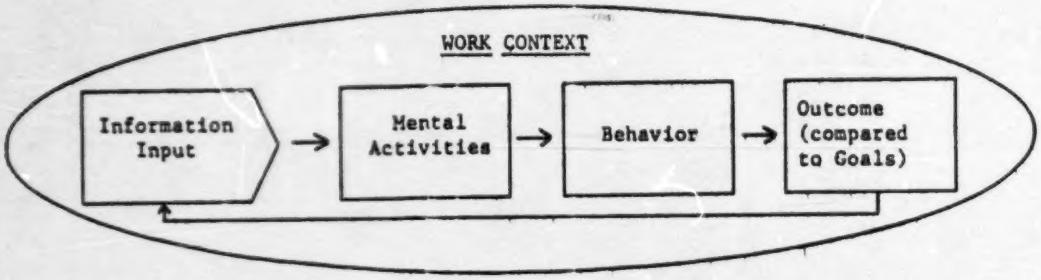

Figure 1. Paradigm of the Occupation Analysis Inventory (OAI)

dimensions. For purposes of combining all sections of OAI elements, 128 of the first-order factors were, in turn, subjected to a single factor analysis which produced 28 orthogonal higher-order factors. In general, both the first- and the higher-order work dimensions were meaningful and stable (as determined by Tucker's coefficient of congruence). It is believed that the OAI work dimensions will prove useful in the description and classification of jobs and occupations (and possibly occupationally related curricula), and in occupationally related test development. A recently completed study has demonstrated the utility of the OAI work dimensions in the derivation of an occupational cluster structure (Pass and Cunningham, 1975).

Since the OAI was designed to analyze and describe jobs in terms relevant to human behavior, it was considered both desirable and feasible (in terms of existing technology) to link the OAI work elements to defined human attributes in the cognitive, psychomotor, and affective domains (i.e., to selected abilities, interests, and needs). Accordingly, 103 human attributes were defined for which there were existing tests and inventories in the three domains. Estimated requirements were then established for each OAI work element on each of the 103

human attributes, according to the job-component (or synthetic) procedure developed by E. J. McCormick at Purdue University (McCormick, Cunningham, and Thornton, 1967; McCormick, Jeanneret, and Mecham, 1972; Neeb, Cunningham, and Pass, 1971). The derived linkages between the OAI work elements and the 103 measurable human attributes expanded the capability of the OAI; based on those linkages, the OAI could provide estimates of a job's requirements for the aforementioned human attributes, as well as a description of the activities and conditions (in terms of work elements and dimensions) involved in the job.

In two subsequent studies, the attribute-requirement weights developed by Neeb et al. for the OAI work elements were used to derive attribute-requirement estimates for samples of jobs that had been rated on the OAI. Essentially, the procedure for deriving the attribute-requirement estimates consisted of summing the cross-products of a job's ratings on the OAI work elements times the elements' weights on the attribute in question. (For a description of this procedure see Tuttle and Cunningham, 1972, or Pass and Cunningham, 1975). In one of the two studies (Bates and Cunningham, in press), the OAI aptitude-requirement estimates and work-dimension (factor) scores for a sample of jobs were correlated with the mean General Aptitude Test Battery scores of job incumbents. In addition, the estimated requirements of a second sample of jobs for several general vocational capabilities were related (by analysis of variance) to the general vocational capabilities test scores of students nearing completion of postsecondary vocational and technical education programs corresponding to the jobs in the sample. Both sets of analyses showed a number of significant

relationships, providing support for the construct validity of the OAI attribute-requirement estimates.

Of particular interest for purposes of the present report is a second study conducted by Tuttle and Cunningham (1972), who attempted to establish relationships between (a) the OAI work-dimension scores and attribute-requirement estimates for jobs and (b) the interest, need, and satisfaction scores of job incumbents. The data in that study consisted of the work-dimension scores and interest- and need-requirement (reinforcement)[1] estimates for a sample of OAI-rated jobs and the scores of incumbents in related jobs (i.e., jobs with the same Dictionary of Occupational Titles numbers and titles) on the following inventories: the Ohio Vocational Interest Survey (OVIS), the Minnesota Importance Questionnaire (MIQ), and the Minnesota Satisfaction Questionnaire (MSQ). The interests and needs for which OAI job-requirement estimates were obtained corresponded to the OVIS interests, MIQ needs, and MSQ satisfactions. A number of statistical analyses were performed on the data in order to test seven general hypotheses concerning relationships between the OAI variables and the three forenamed sets of affective measures. Of those seven hypotheses, five received substantial support, and the remaining two were at least partially supported. From the results, it was concluded that the OAI work-dimension scores and attribute-requirement estimates for jobs and occupations possess demonstrated relevance to the interests, needs, and satisfactions of job incumbents.

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[1]The term "requirement" is used here in order to maintain consistency with the use of the expression "attribute-requirement estimates" in reference to the OAI estimates of the human attribute correlates of jobs and occupations. Although this term is appropriate when used with abilities, the term "reinforcement" would actually be more appropriate in the case of interests and needs.

Encouraged by the findings of the preceding studies, Pass and Cunningham (1975) undertook to further develop the linkages between the OAI and the previously mentioned 103 human attributes. In this connection, the investigators reasoned that an increase in the number of ratings on which the attribute-requirement weights for the OAI work elements were based would increase the reliabilities of those weights and, hence, the stability of attribute-requirement estimates for jobs, as derived from OAI job ratings. Accordingly, 9 or 10 additional ratings were obtained on the requirements of each OAI work element for each of the 103 defined human attributes, and those ratings were combined with an equal number of previously obtained ratings (Neeb et al., 1971) in deriving a revised set of attribute-requirement weights. The result was a matrix containing a weight for each OAI element on each of the 103 human attributes. The resultant matrix of attribute-requirement weights was then used, in combination with OAI job ratings, to derive the estimated attribute requirements for 1414 jobs. Analyses of the data showed substantial reliabilities for both the attribute-requirement weights for the OAI work elements and, more importantly, the attribute-requirement estimates for a sample of jobs. It was concluded that the results seemed ". . . encouraging in regard to the potential utility of the OAI-based attribute-requirement estimates in occupationally related education and guidance" (Pass and Cunningham, 1975).

The present study was designed to test the construct validity of interest- and need-requirement estimates for jobs derived from the revised set of OAI attribute-requirement weights. It was believed that the improved stability of those estimates would increase the strength

of their relationships with the affective measures employed in the previously described Tuttle and Cunningham study.

PURPOSE

The present study was conducted for the purpose of relating the revised OAI interest- and need-requirement estimates for a sample of jobs to the interest, need, and satisfaction scores of job incumbents. Using the revised set of predictor variables (attribute-requirement estimates), this study essentially retested some of the hypotheses tested previously by Tuttle and Cunningham (1972). The dependent variable data in this study were the same as those used previously: the Ohio Vocational Interest Survey, the Minnesota Importance Questionnaire, and the Minnesota Satisfaction Questionnaire scores of job incumbents. In addition to the revised predictor variables, there was a modification in one of the data analysis procedures in this study.

The following four hypotheses were tested.

Hypothesis 1: The OAI interest-requirement (reinforcement)[2] estimates for jobs will correlate positively with the corresponding mean Ohio Vocational Interest Survey scores of job incumbents. This prediction is based on the assumption that "Individuals strive to establish and maintain congruence between their personal characteristics and the characteristics of their work environment" (Tuttle and Cunningham, 1972).

Hypothesis 2: The OAI need-requirement (reinforcement) estimates for jobs will correlate with the corresponding mean Minnesota Importance Questionnaire scores of job incumbents. In the Tuttle and Cunningham study, this prediction was based on the same assumption underlying Hypothesis 1; thus, it was expected that all of the correlations would

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[2] Ibid.

be positive. Contrary to that expectation, however, Tuttle and Cunningham obtained six significant negative correlations and only three significant positive correlations (out of a total of 15 correlations). An ex post facto classification of the MIQ needs showed that all but one of the negative correlations fell into Alderfer's (1969) Existence and Relatedness categories (an MIQ need with one of the negative correlations was not classified), while all of the significant positive correlations fell into his Growth category. That finding was consistent with Alderfer's E.R.G. theory, which holds that deprivation in relation to the existence and relatedness needs leads to an increase in their strength, while deprivation in relation to the growth needs leads to an increase in the strength of more basic (relatedness) needs; and that satisfaction in relation to the existence and relatedness needs leads to an increase in the strength of higher-order needs (relatedness and growth, respectively), whereas satisfaction in relation to the growth needs leads to an increase in the strength of those needs. Reasoning from Alderfer's propositions, one would predict that for the existence and relatedness needs the OAI need-requirement (reinforcement) estimates for jobs would correlate negatively with the corresponding MIQ need scores of job incumbents, but for the growth needs these correlations would be positive. However, because of the after-the-fact nature of this reasoning and the overlap in data between Tuttle and Cunningham and the present study, the correlations obtained in this study can only be interpreted for heuristic purposes.

Hypothesis 3: There will be a systematic relationship between the OAI need-requirement (reinforcement) estimates for jobs and the

Minnesota Satisfaction Questionnaire scores of job incumbents, and this relationship will be moderated by the incumbents' MIQ need scores. A two-by-two factorial design was used to test this hypothesis, with OAI need-requirement scores for jobs serving as one factor, MIQ need scores of job incumbents as the second factor, and MSQ (satisfaction) scores of incumbents as the dependent variable. An analysis of variance was applied separately under this design for each of 15 MIQ need scales and its corresponding OAI need-requirement estimate and MSQ scale. In each case, the OAI-rated jobs were divided into high- and low-reinforcement categories based on their need-requirement estimates, incumbents in the related jobs were divided into high- and low-scoring groups on the corresponding MIQ need, and the scores of incumbents on the appropriate MSQ scale were entered in the cells of the factorial design. In performing these analyses, the investigators reasoned that an individual who is both high on a particular need and employed in a job that is high on the reinforcement dimension for that need is in a congruent (or satisfying) situation; conversely, an individual who is high on a particular need but employed in a job that is low on reinforcement for that need is in an incongruent (or unsatisfying) situation. For individuals who are low on a specified need, the reinforcement characteristics of the job in relation to that need dimension should have little effect upon satisfaction, although it might be expected that satisfaction would be slightly higher in the high-reinforcement situation, particularly in the cases of the lower-order (or hygiene) needs. Based on the foregoing rationale, Hypothesis 3 was broken down into three specific predictions: (a) there will be a significant OAI need-requirement (reinforcement)

main effect in favor of the high-reinforcement category; (b) there will be a significant interaction between the MIQ need and OAI need-reinforcement factors; and (c) the high-need, high-reinforcement group will have significantly higher satisfaction (MIQ) scores than the high-need, low-reinforcement group.

Hypothesis 4: Worker satisfaction, as measured by the MSQ, will be positively related to the measured degree of congruence between the worker's MIQ need profile and his/her job's OAI need-requirement (reinforcement) profile. This hypothesis was tested separately for three different kinds of satisfaction: (1) overall satisfaction, as measured by the MSQ general score; (2) extrinsic satisfaction, as measured by the sum of the scores on MSQ scales classified as "extrinsic"; and (3) intrinsic satisfaction, as measured by the sum of the scores on MSQ scales classified as "intrinsic."

PROCEDURES AND RESULTS

The procedures and results are reported in two sections: (1) Samples, Variables, and Data Collection Procedures; and (2) Analyses and Results.

Samples, Variables, and Data Collection Procedures

This section of the report describes the job and subject samples, the instruments and variables, and the data collection procedures.

Job and Subject Samples

In the Tuttle and Cunningham study, a sample of 47 occupations was selected roughly in proportion to the projected numbers of people employed in the 11 major occupational categories of the Bureau of the Census (see Appendix A). In addition to the requirement that the sample of occupations be reasonably representative of the 11 Census categories, the selection of occupations was subject to the constraint that adequate United States Employment Service (USES) job descriptions be available for each selected occupation[3] and that it be possible to gain access to an adequate number of job incumbents in each occupation for testing purposes. Organizations that agreed to participate in the study were asked to select subjects (job incumbents) who: (a) had worked in

[3]Although occupations were selected, jobs representing each occupation were rated on the OAI; for each selected occupation, a representative USES job schedule (written job description) describing a job with the same title and DOT number as the occupation was rated on the OAI. For purposes of the Ergometric Project, an "occupation" is defined as a set of similar jobs across different establishments, while a "job" is defined as a set of similar positions existing within the same establishment (Cunningham, 1971).

the particular jobs for at least one year, (b) were willing to participate, and (c) were judged to have at least an eighth-grade reading level. Over 900 subjects were tested, all of whom were employed in jobs with the same DOT numbers and titles as the selected occupations. With the exception of two occupations, the subjects were employed in North Carolina. For one of the two exceptions, Elementary Teacher, 80 percent of the subjects worked in west central Florida; for the other, Wood Technologist, roughly 30 percent worked in scattered locations outside North Carolina.

The present study included the data for 43 of the 47 occupations selected by Tuttle and Cunningham. Four of the original occupations were excluded from this study because of inadequate numbers of subjects. Appendix B lists the DOT numbers and titles for the 43 occupations included in this study and indicates the number of subjects completing each inventory (OVIS, MIQ, and MSQ) in each occupation. Appendix C contains a list of the participating organizations.

OAI Attribute-Requirement Estimates for Jobs: The Predictor Variable

As noted previously, the attribute-requirement estimates for jobs were based on a revised set of attribute-requirement weights for the OAI work elements. The estimates were derived according to McCormick's job-component procedure and involved, essentially, taking the sum of the cross products of a job's ratings on the OAI work elements times the elements' weights on the attribute in question. For each attribute, the sums of cross products for 1414 jobs were standardized, with a constant added to eliminate negative values. A detailed description of the

procedures for deriving the attribute-requirement estimates for jobs is presented in a report by Pass and Cunningham (1975).

Estimated job requirements for 24 interests and 15 needs comprised the predictor variables in the present study. The interest- and need-requirement (reinforcement) estimates were based on OAI ratings of the USES descriptions of 43 jobs representing the 43 occupations in the study.[4] The 24 interest-requirement estimates for each job corresponded to the 24 scales of the OVIS, and the 15 need-requirement estimates corresponded to 15 of the 20 MIQ scales. Five MIQ needs were omitted from the study: Company Policies and Practices, Co-Workers, Moral Values, Supervision--Human Relations, and Supervision--Technical. The Moral Values need was not included because of the unreliability of the OAI-derived job-requirement estimate for that need (Pass and Cunningham, 1975); the other four needs were omitted because they pertain to situational factors which are not necessarily constant across specific work situations within the same occupation. Because of their situational characteristics, no attempt has been made to link the Company Policies and Supervision (Human Relations and Technical) needs to the OAI work elements.

The Affective Measures

Three inventories were administered to job incumbents: the Ohio Vocational Interest Survey, the Minnesota Importance Questionnaire, and the Minnesota Satisfaction Questionnaire. The number of incumbents completing each inventory in each occupation is shown in Appendix B.

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[4] Ibid.

The Ohio Vocational Interest Survey (OVIS) was developed in accordance with the conceptual framework used in the Dictionary of Occupational Titles (DOT) (U. S. Department of Labor, 1965). The instrument contains 24 scales representing classes of DOT worker-trait groups with similar values on the People, Data, and Things dimensions (D'Costa et al., 1970). The data available on the OVIS indicate that its scales are reasonably reliable but substantially intercorrelated, i.e., there is some lack of independence among the scales. Although validity data for the OVIS are limited, the OVIS scales have been found to discriminate among groups of students enrolled in academic, general, business, and vocational programs. Because of its relationship to the DOT, the OVIS should prove useful in occupational guidance.

The Minnesota Importance Questionnaire (MIQ) was developed in connection with the research of the Work Adjustment Project at the University of Minnesota (Weiss, Dawis, Lofquist, and England, 1966). The MIQ contains 210 items and yields 20 need-scale scores. Although the reliabilities of some of the MIQ scales are not exceptionally high (Hendel and Weiss, 1970), the scales are sufficiently stable for research purposes. Moreover, the validity of the MIQ is supported by several studies (Weiss et al., 1964a, 1964b, 1967; Golden and Weiss, 1968; Betz, 1969), and its 20 need-scale definitions are reasonably compatible with several motivation theories (e.g., Alderfer, 1969; Herzberg et al., 1959; Maslow, 1943).

The Minnesota Satisfaction Questionnaire (MSQ) contains 100 items and yields scores on the same 20 dimensions as the MIQ, i.e., the MSQ yields satisfaction scores corresponding to the 20 MIQ needs.

In addition, the MSQ provides a general (overall) satisfaction score drawing one item from each of the 20 scales. The MSQ scales have shown adequate reliability (Hendel and Weiss, 1970) and some evidence of construct validity (Weiss et al., 1964b, 1967).

The administration of the inventories to job incumbents was accomplished in one of three ways. The preferred method, supervised testing, was employed in collecting most of the data (about 80 percent of the cases). That method involved group administration of the inventories to job incumbents during their paid working time. Both of the other methods involved unsupervised administration of the inventories. Under one of those methods, incumbents were given the inventories and instructions in person but were left to complete the inventories without supervision (usually on their own time). The other, less desirable, unsupervised method involved distribution and return of the inventories by mail, with no personal contact between the investigators and the subjects. The unsupervised procedures were used in gathering approximately 20 percent of the data. With three exceptions, job incumbents in all occupations completed all three inventories (OVIS, MIQ, and MSQ). For one exception, Psychologist, graduate students at the master's level or above (M.S. degree or all but thesis completed) were used as subjects and were not administered the MSQ, since a satisfaction measure did not seem appropriate at that point in their careers. Because of situational constraints, only the OVIS was administered for the other two exceptions, Patrolman and Tobacco Grower.

The instructions given to the subjects are presented in the appendix of the previous report by Tuttle and Cunningham (1972). Appendix B in the present report shows the number of incumbents completing each inventory in each occupation; the Tuttle and Cunningham report (Appendix K) presents the mean scale scores of incumbents by occupation. A list of the participating organizations is shown in Appendix C of this report.

Analyses and Results

In recapitulation, the following hypotheses were tested:

Hypothesis 1: The OAI interest-requirement (reinforcement) estimates for jobs will correlate positively with the corresponding OVIS scores of incumbents in those jobs.

Hypothesis 2: The OAI need-requirement (reinforcement) estimates for jobs will correlate with the corresponding MIQ (need) scores of incumbents in those jobs.

Hypothesis 3: There will be a systematic relationship between the OAI need-requirement (reinforcement) estimates for jobs and the MSQ (satisfaction) scores of job incumbents, and this relationship will be moderated by the incumbents' MIQ need scores. The specific predictions from this hypothesis were as follows: (a) there will be a significant OAI need-requirement (reinforcement) main effect in favor of the high-reinforcement category; (b) there will be a significant interaction between the MIQ need and OAI need-requirement factors; and (c) the high-need, high-reinforcement group will have significantly higher satisfaction scores (as measured by the MSQ) than the high-need, low-reinforcement group.

Hypothesis 4. Worker satisfaction, as measured by the MSQ, will be positively related to the measured degree of congruence between the worker's MIQ need profile and his/her job's OAI need-requirement (reinforcement) profile.

Hypothesis 1

The first hypothesis was tested by correlating the OAI interest-requirement (reinforcement) estimates for 43 jobs (USES job descriptions) with the mean scores of incumbents in similar jobs (i.e., jobs with the same titles) on corresponding OVIS scales.[5] A correlation was computed for each of the 24 interests defined by the OVIS scales. As shown in Table 1, 16 of those correlations are statistically significant based on a one-tailed test (DuBois, 1965).

Hypothesis 2

Only 41 occupations were included in the analyses for Hypothesis 2. Otherwise, Hypothesis 2 was tested in the same manner as Hypothesis 1: the OAI need-requirement (reinforcement) estimates for 41 jobs (USES job descriptions) were correlated with the mean scores of incumbents in similar jobs (i.e., jobs with the same titles) on corresponding MIQ need scales. A correlation was computed for each of 15 needs defined by the MIQ scales. (Five of the 20 MIQ needs were omitted for reasons indicated earlier.)

Table 2 presents the correlations for the 15 needs, classified under Alderfer's E.R.G. categories. As shown, nine of those correlations

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[5] Ibid.

Table 1

Correlations Between the OAI Interest-Requirement Estimates for 43 Jobs and the Mean OVIS Scores of Incumbents in Similar Jobs

Interest	N = 43
Manual Work	.40*
Machine Work	.60*
Personal Service	-.26
Care of People or Animals	.25*
Clerical Work	-.03
Inspecting and Testing	.13
Crafts	.55*
Customer Service	-.12
Nursing	.43*
Skilled Personal Service	-.28
Training	.29*
Literary	.42*
Numerical	.41*
Appraisal	.61*
Agriculture	.45*
Applied Technology	.66*
Promotion and Communication	.62*
Management	.55*
Artistic	-.13
Sales Representative	.38*
Music	.14
Entertainment	-.04
Teaching, Counseling, and Social Work	.51*
Medical	.55*

*$p < .05$, one-tailed test.

Table 2

Correlations Between the OAI Need-Requirement (Reinforcement) Estimates for 41 Jobs and the Mean MIQ Need Scores of Incumbents in Similar Jobs

Need	N = 41
Existence	
Activity	-.29
Compensation	-.48*
Security	-.52*
Variety	-.21
Working Conditions	-.52*
Relatedness	
Advancement	-.14
Authority	.15
Independence	-.60*
Recognition	-.33*
Social Status	-.33*
Growth	
Ability Utilization	.13
Achievement	.16
Creativity	.64*
Responsibility	.46*
Social Service	.45*

*$p < .05$, two-tailed test.

are statistically significant based on a two-tailed test (DuBois, 1965). The signs of all of the significant correlations are in agreement with Alderfer's theory although, as indicated earlier, the needs were assigned to Alderfer's categories on an ex post facto basis.

Hypothesis 3

Hypothesis 3 was tested in a two-by-two factorial design, with OAI need-requirement (reinforcement) estimates for jobs serving as one factor, MIQ need scores of job incumbents as the second factor, and MSQ (satisfaction) scores of incumbents as the dependent variable. An analysis of variance was applied separately under this design for each of 15 MIQ need scales and its corresponding OAI need-requirement estimate and MSQ scale; i.e., 15 analyses of variance were performed, one for each need. In each case, the OAI-rated jobs were divided into high- and low-reinforcement categories based on their need-requirement estimates, incumbents in the related jobs were divided into high- and low-scoring groups on the corresponding MIQ need, and the scores of incumbents on the appropriate MSQ scale were entered in the cells of the factorial design. For the OAI need-requirement factor, the high category contained jobs whose estimated requirements for the relevant need were in the top third of the sample, while the low category contained jobs with estimates in the bottom third; jobs whose estimates fell in the middle third were excluded from the analysis. For the MIQ need factor, the high group contained subjects who (a) were employed in jobs related to those in the top and bottom thirds on the OAI need-requirement factor and (b) scored in the top third among the subjects within their respective

occupations (i.e., among incumbents in jobs with the same titles) on the relevant MIQ need; the low MIQ group contained subjects whose jobs were also related to the jobs in the top and bottom thirds on the OAI need-requirement factor, but who scored in the bottom third among the subjects within their respective occupations on the relevant MIQ need. In other words, subjects in each occupation represented in the high or low categories on the OAI need-requirement factor were divided into high-, middle-, and low-scoring thirds (within their respective occupations) on the relevant MIQ need, and the high- and low-scoring thirds were assigned to the high and low need groups on the MIQ factor. The above procedure differed from that in the Tuttle and Cunningham study, where subjects in the high and low groups on the MIQ need factor scored in the top and bottom thirds among all subjects in the study (i.e., where subjects were not assigned to high- and low-scoring groups within each occupation).

Tables 3, 4, and 5 present the results of the analyses testing Hypothesis 3. The results pertaining to Hypothesis 3a are shown in Table 3, where it can be seen that 12 of the 15 F values for the predicted OAI need-requirement (reinforcement) main effect are statistically significant based on a "one-tailed" (directional) test. As shown in Table 4, however, only three of the need-by-reinforcement interactions predicted under Hypothesis 3b were statistically significant. Despite the lack of statistical significance for all but three of the predicted interactions, the simple main effects for the OAI need-requirement (reinforcement) factor were tested within both levels of the MIQ need factor. Of particular interest in regard to Hypothesis 3c is the simple main effect of the OAI need-requirement factor within the high MIQ need

Table 3

Mean Satisfaction Scores and ANOVA Results for OAI
Need-Requirement (Reinforcement) Main Effect

Scale	N	$\bar{X}$ Hi-Reinf.	N	$\bar{X}$ Lo-Reinf.	df	F
Ability Utilization	135	16.73	172	15.77	1,303	3.30*
Achievement	135	16.81	172	16.48	1,303	.53
Activity	164	17.80	162	16.87	1,322	4.63*
Advancement	155	14.65	175	12.22	1,326	23.15*
Authority	152	16.14	178	14.81	1,326	13.11*
Compensation	155	14.28	167	12.56	1,318	12.78*
Creativity	169	16.75	174	14.71	1,339	18.37*
Independence	142	16.45	170	16.44	1,308	.01
Recognition	150	14.99	176	13.95	1,322	4.57*
Responsibility	153	16.63	166	15.48	1,315	7.42*
Security	151	17.68	165	16.38	1,312	9.19*
Social Service	146	18.82	168	15.38	1,310	57.23*
Social Status	141	16.03	168	14.74	1,305	10.31*
Variety	143	16.96	180	15.71	1,319	6.55*
Working Conditions	149	15.09	168	14.45	1,313	1.60

*$p < .05$, "one-tailed" (directional) test.

Table 4

ANOVA Results for the MIQ Need X OAI Need-Requirement (Reinforcement) Interaction

Scale	df	F
Ability Utilization	1,303	.83
Achievement	1,303	.01
Activity	1,322	.24
Advancement	1,326	2.44
Authority	1,326	2.73
Compensation	1,318	1.91
Creativity	1,339	5.38*
Independence	1,308	2.66
Recognition	1,322	.12
Responsibility	1,315	.01
Security	1,312	7.18*
Social Service	1,310	2.31
Social Status	1,305	3.42
Variety	1,319	.46
Working Conditions	1,313	.11

*$p < .05$

Table 5

ANOVA Results for the OAI Need-Requirement (Reinforcement)
Simple Main Effects

Scale	Low Need				High Need			
	Lo-R	Hi-R	df	F	Lo-R	Hi-R	df	F
Ability Utilization	16.20	16.69	1,303	.43	15.30	16.76	1,303	3.67**
Achievement	16.28	16.57	1,303	.21	16.69	17.04	1,303	.33
Activity	16.27	17.01	1,322	1.43	17.49	18.67	1,322	3.38**
Advancement	12.87	14.51	1,326	5.25*	11.58	14.78	1,326	20.43**
Authority	14.81	15.54	1,326	1.98	14.81	16.78	1,326	13.62**
Compensation	13.65	14.70	1,318	2.49	11.44	13.82	1,318	11.90**
Creativity	14.43	15.37	1,339	1.95	14.99	18.17	1,339	21.62**
Independence	16.38	15.72	1,308	1.19	16.51	17.27	1,308	1.47
Recognition	14.30	15.51	1,322	3.12	13.59	14.47	1,322	1.59
Responsibility	15.05	16.15	1,315	3.55	15.94	17.12	1,315	3.88**
Security	16.60	16.76	1,312	.06	16.14	18.67	1,312	15.80**
Social Service	14.72	17.47	1,310	18.37*	16.05	20.18	1,310	41.04**
Social Status	14.87	15.41	1,305	.93	14.61	16.63	1,305	12.78**
Variety	15.16	16.10	1,319	1.80	16.26	17.86	1,319	5.14**
Working Conditions	14.66	15.13	1,313	.45	14.24	15.04	1,313	1.24

*p < .05, "two-tailed" (nondirectional)

**p < .05, "one-tailed" (directional) test.

group. As shown in Table 5, that simple main effect was statistically significant in 11 cases, while the simple main effect within the low MIQ need group was significant in only two instances. Because no prediction was made concerning the reinforcement simple main effect at the low-need level, a "two-tailed" (nondirectional) test was applied to that effect, while a "one-tailed" (directional) test was applied to the simple main effect at the high-need level (to which Hypothesis 3c was addressed).

Hypothesis 4

Hypothesis 4 concerned the relationship of job satisfaction to the degree of congruence between the worker's MIQ need profile and the OAI need-requirement (reinforcement) profile of his/her job. The MIQ(need)-OAI(reinforcement) profile congruence was determined by the following procedure:

(1) For each of the 15 needs, the MIQ scores for the total sample of subjects (across all jobs) were transformed into one of three values: +1, if the subject's score fell above +.94 standard deviations from the mean; -1, if the subject's score fell below -.94 standard deviations from the mean; and 0, if the subject's score fell within .94 standard deviations of the mean. Similarly, for each of the same needs, the OAI need-requirement (reinforcement) estimates for all jobs in the sample were transformed into the same three values: +1, if the job's need-requirement estimate fell above +.94 standard deviations from the mean estimate; -1, if the job's estimate fell below -.94 standard deviations from the mean; and 0, if the job's estimate fell within .94 standard deviations of the mean. Thus, for each of the 15 needs, there were nine possible

combinations of transformed MIQ scores and corresponding OAI need-requirement estimates (three MIQ values times three OAI values).

(2) Next, the 15 MIQ needs were classified by the investigators into two basic categories: "extrinsic" and "intrinsic," as indicated in the footnotes in Table 6. Under each of those two basic categories, the investigators then assigned a priori congruence, or "match," weights to each of the nine possible combinations of transformed MIQ need and OAI need-requirement (reinforcement) values. Each match weight represented the investigators' judgment of the effects of that particular need-reinforcement (MIQ-OAI) combination upon worker satisfaction (i.e., the higher the value of the match weight, the higher the predicted level of satisfaction associated with the specified need-reinforcement combination). As shown in Table 6, the a priori match weights for the nine possible need-reinforcement combinations differed between the extrinsic and intrinsic need categories.

(3) The match weights shown in Table 6 allowed the investigators to assign each subject a need-reinforcement congruence (or match) value for each of the 15 MIQ needs, based on his/her particular MIQ-OAI combination on the specified need. Those 15 separate congruence values, in turn, provided the basis for deriving three congruence scores for each subject: an extrinsic need-reinforcement congruence score consisting of the sum of the subject's congruence values on the extrinsic needs, an intrinsic need-reinforcement congruence score consisting of the sum of the subject's congruence values on the intrinsic needs, and an overall need-reinforcement congruence score consisting of the sum of all the subject's congruence values (or the sum of the extrinsic and

Table 6

Worker-Job Match Weights for Nine Possible Combinations of Transformed Scores Under Extrinsic and Intrinsic Needs

Scale Scores for Workers	Reinforcement Scores for Jobs	Worker-Job Match Weight[a]
	Extrinsic Needs[b]	
+1	+1	+2
+1	0	-1
+1	-1	-2
0	+1	+1
0	0	0
0	-1	-1
-1	+1	0
-1	0	0
-1	-1	0
	Intrinsic Needs[c]	
+1	+1	+2
+1	0	-1
+1	-1	-2
0	+1	0
0	0	0
0	-1	-1
-1	+1	-1
-1	0	0
-1	-1	0

[a]A match weight could have one of five possible values.

[b]A worker-job match weight was determined for each of the following extrinsic needs: Activity, Advancement, Authority, Compensation, Independence, Recognition, Security, Social Status, Variety, and Working Conditions.

[c]A worker-job match weight was determined for each of the following intrinsic needs: Ability Utilization, Achievement, Creativity, Responsibility, and Social Service.

intrinsic scores). In addition, three corresponding satisfaction scores were determined for each subject: an extrinsic satisfaction score consisting of the sum of the subject's MSQ scores on the extrinsic needs, an intrinsic satisfaction score consisting of the sum of the subject's MSQ scores on the intrinsic needs, and an overall satisfaction score consisting of the subject's MSQ general score (based on one item from each of the MSQ scales).

For the purpose of testing Hypothesis 4, subjects were ranked on each of the three congruence measures (extrinsic, intrinsic, and overall), and the upper and lower quartiles were determined for each measure. Hypothesis 4 was tested by statistically comparing mean satisfaction scores between the two groups formed by workers among the lowest and highest 25 percent on need-reinforcement congruence. Two such groups were formed for each of the three sets of congruence scores (i.e., a low and a high group for each congruence measure), and the groups were compared by analysis of variance on the appropriate satisfaction measure.

Table 7 presents the mean satisfaction scores for the three pairs of groups and the F values for comparisons between groups. As shown, the mean for the high-congruence group exceeds that for the low-congruence group in all three cases ($p < .05$).

Table 7

Mean Satisfaction Scores of the Low and High Need-Reinforcement (MIQ-OAI) Congruence Groups and F-Values for Group Comparisons

	N	Low-Congruence Group	N	High-Congruence Group	F Value
Extrinsic	211	148.18	193	160.12	14.15*
Intrinsic	210	76.68	195	84.93	20.63*
Overall	209	61.34	194	65.55	9.85*

*$p < .05$, one-tailed (directional) test.

DISCUSSION

The reported study was conducted for the purpose of relating a revised set of OAI interest- and need-requirement estimates for a sample of jobs to the interest, need, and satisfaction scores of job incumbents. Using the revised set of estimates, this study essentially retested some of the hypotheses tested previously by Tuttle and Cunningham (1972). As indicated, the dependent variable data in this study were the same as those used by Tuttle and Cunningham: the OVIS, MIQ, and MSQ scores of previously tested job incumbents. In addition to the revision in the predictor variables (attribute-requirement estimates), there was a modification in one of the data analysis procedures in this study (the Hypothesis 3 analysis).

The results are discussed in relation to the four hypotheses tested.

Hypothesis 1

Hypothesis 1 stated that the OAI interest-requirement (reinforcement) estimates for a sample of jobs would correlate positively with the corresponding mean Ohio Vocational Interest Survey scores of job incumbents (i.e., incumbents in jobs similar to those analyzed on the OAI). The hypothesis was based on two assumptions: (a) that individuals strive to establish and maintain congruence between their personal characteristics and the characteristics of their work environment, and (b) that the OAI attribute-requirement estimates and OVIS scales are valid. As shown in Table 1, 16 of the 24 correlations computed support the hypothesis.

Hypothesis 2

Hypothesis 2 stated that the OAI need-requirement (reinforcement) estimates for jobs would correlate with the corresponding mean Minnesota Importance Questionnaire scores of job incumbents. Originally, this hypothesis was based on the same assumptions underlying Hypothesis 1. As noted, however, Tuttle and Cunningham obtained more negative than positive correlations. Upon examination of their results, those investigators found that most of the needs for which negative correlations were obtained fell into Alderfer's (1969) Existence and Relatedness categories, while most of the needs with positive correlations fell into his Growth category. Although no research conclusions could be drawn from that observation, it was quite consistent with the previously stated assumptions associated with Alderfer's E.R.G. theory, and thus suggestive of the validity of the OAI need-requirement estimates (i.e., their validity would be supported if the same results were obtained in future research).

The 15 correlations computed in the present study were presented in Table 2, which contains six significant negative correlations and three significant positive correlations. The signs for all of the significant correlations are in agreement with Alderfer's theory; that is, the signs are negative for the Existence and Relatedness needs and positive for the Growth needs. Although two of the needs, Activity and Variety, were unclassified in the Tuttle and Cunningham study, the present investigators believed that the research literature pertaining to activity and novel stimulation (e.g., Butler, 1953, 1954; Hebb, 1955; Kagan and Berkun, 1954) warranted assigning those two needs to Alderfer's Existence category.

Because of (a) the ex post facto nature of Tuttle and Cunningham's explanation of the OAI-MIQ correlations and (b) the data overlap between this study and theirs, the results presented here can only be interpreted for heuristic purposes. A replication of these findings with a new sample will be required to support the conclusion that the OAI and MIQ variables correlate in accordance with Alderfer's E.R.G. theory.

Hypothesis 3

Hypothesis 3 stated that there would be a significant relationship between the OAI need-requirement (reinforcement) estimates for jobs and the MSQ (satisfaction) scores of job incumbents, and that this relationship would be moderated by the incumbents' MIQ need scores. Specifically, it was predicted that: (a) there would be a significant OAI need-requirement (reinforcement) main effect in favor of the high-reinforcement category; (b) there would be a significant interaction between the MIQ need and OAI need-requirement factors; and (c) the high-need, high-reinforcement group would have a significantly higher mean satisfaction score (as measured by the MSQ) than the high-need, low-reinforcement group. The above predictions were tested in a two-by-two factorial design, with OAI need-requirement (reinforcement) estimates for jobs serving as one factor, MIQ need scores of job incumbents as the second factor, and MSQ (satisfaction) scores of incumbents as the dependent variable. A separate analysis of variance was applied under this design to each of 15 MIQ need scales and its corresponding OAI need-requirement estimate and MSQ scale; i.e., 15 analyses of variance were performed, one for each need.

The results are in general support of Hypothesis 3. Of the 15 analyses performed for each of the three specific predictions, the results of 12 analyses supported Hypothesis 3a, 3 supported Hypothesis 3b, and 11 supported Hypothesis 3c (see Tables 3, 4, and 5). Interestingly, though only 3 of the need-by-reinforcement interactions were significant, 11 of the reinforcement (OAI) simple main effects at the high-need (MIQ) level were significant, compared to only two significant simple main effects at the low-need level. Because no prediction was made concerning the reinforcement simple main effect at the low-need level, a "two-tailed" (nondirectional) test was applied to that effect, while a "one-tailed" (directional) test was applied to the simple main effect at the high-need level (to which Hypothesis 3c was addressed).

Hypothesis 4

Hypothesis 4 held that worker satisfaction, as measured by the MSQ, would be positively related to the measured degree of congruence between the worker's MIQ need profile and his/her job's OAI need-requirement (reinforcement) profile. This hypothesis was tested with three different measures of congruence and satisfaction: extrinsic, intrinsic, and overall. In all three cases, the mean satisfaction score of subjects in the high-congruence group exceeded that of the low-congruence group ($p < .05$), thus supporting Hypothesis 4.

It must be noted in connection with these findings, however, that the analyses were conducted without regard to the identity of the subjects' jobs, thus allowing the possibility of disproportionate representation of some jobs (in terms of number of subjects) in the

low- or high-congruence groups (i.e., certain jobs may have been more heavily represented in one group than the other). To the extent that such unequal representation occurred, the differences between the low- and high-congruence groups might reflect differences in the satisfaction potential of various jobs for a constant (or average) worker, rather than differences among individuals in satisfaction derived from fixed jobs. In future research, it would be desirable to have enough workers for each job to allow the establishment of low- and high-congruence groups on a per job basis.

General Conclusions

The results obtained in this study offer rather consistent support for the construct validity of the OAI attribute-requirement estimates for jobs. Hypotheses 1, 2, and 3 (with the exception of 3b) were supported by the majority of their statistical tests; and the results were consistent with Hypothesis 2, though as already noted, the directions of the six significant negative correlations obtained under that hypothesis were explained on an ex post facto basis.

The results reported here are in general agreement with those obtained previously by Tuttle and Cunningham (1972). In that regard, it was expected that the revised attribute-requirement estimates used in this study would show stronger relationships with the three affective measures (OVIS, MIQ, and MSQ) than the original OAI estimates used by Tuttle and Cunningham. Although there was a slight improvement in that direction, the gain was not as large as expected. Between the two studies, there was an increase of one additional significant correlation

under Hypothesis 1 and three additional significant main effects under Hypothesis 3. Comparisons between the two studies could be made on only 7 of the 15 tests of simple main effects under Hypothesis 3c, since Tuttle and Cunningham tested the simple main effects for only those seven needs whose MIQ-by-OAI interactions approached significance ($p < .20$); all seven effects were significant in both studies. In addition, the results in both studies were significant for all three statistical tests performed under Hypothesis 4.

From the results of both studies, it can be concluded that the OAI attribute-requirement estimates for jobs and occupations possess demonstrated relevance to the interests, needs, and satisfactions of job incumbents. In their present stage of development, the OAI variables should prove useful in research dealing with human behavior in relation to the characteristics of the work environment. Moreover, it seems reasonable to expect that with further development, the OAI variables will prove useful in such educational areas as occupational exploration, guidance, and curriculum analysis.

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APPENDICES

APPENDIX A

BREAKDOWN OF THE JOB SAMPLE BY MAJOR CENSUS CATEGORIES

Table 8

Breakdown of the Job Sample by Major Census Categories

Category	Proportional No.[a]	Actual No.
Professional, technical and kindred	6	11
Managers, officials, and proprietors, except farm	5	6
Clerical and kindred	8	10
Sales	3	2
Total White Collar	22	29
Craftsmen, foremen and kindred	6	4
Operatives and kindred	8	5
Laborers, except farm and mine	2	2
Total Blue Collar	16	11
Private household workers	1	--
Service workers, except private household	4	6
Total Service	5	6
Farmers, farm managers	2	1
Farm laborers, foremen	2	--
Total Farm	4	1
Total--All Occupations	47	47[b]

[a]Proportional number of jobs based on projections of the distribution of the 1970 work force reported in Matthews (1968).

[b]Although 47 jobs (USES job descriptions) were drawn from the Tuttle and Cunningham study, only 43 of those jobs were included in the present study.

APPENDIX B

SAMPLE OF 43 JOBS RATED ON THE OCCUPATION ANALYSIS INVENTORY; NUMBERS OF INCUMBENTS IN RELATED JOBS COMPLETING THE OVIS, MIQ, AND MSQ

JOB SAMPLE

	Title	DOT Code	Number of Subjects OVIS	MIQ	MSQ
1.	Assembler, Electrical Controls	729.884	49	45	49
2.	Audit Clerk	210.388	21	21	21
3.	Bookkeeping Machine Operator	215.388	10	10	11
4.	Carpenter (apprentice)	860.381	26	13	26
5.	Case Worker	195.108	20	20	20
6.	Chemist, Organic	022.081	11	11	11
7.	Clerk, General Office	219.388	21	21	21
8.	Corrections Officer	372.868	20	16	20
9.	Draw Frame Tender	680.885	18	10	18
10.	Electronics Technician	003.181	32	33	29
11.	Engineer, Electrical	003.081	19	18	16
12.	File Clerk	206.388	6	5	6
13.	Fire Fighter	373.884	21	20	21
14.	Fish and Game Warden	379.168	18	18	18
15.	Key Punch Operator	213.582	24	24	25
16.	Lab Tester II	029.381	23	22	24
17.	Librarian	100.168	29	28	28
18.	Licensed Practical Nurse	079.378	10	9	11
19.	Loom Fixer	683.280	22	20	22
20.	Machinist	600.280	15	15	15
21.	Manager, Branch Bank	186.118	22	20	22
22.	Manager, Motel	187.118	13	13	7
23.	Manager, Newspaper Circulation	163.118	15	15	15
24.	Manager, Retail Food Store	185.168	21	21	21
25.	Nurse Aide	355.878	20	17	20
26.	Nurse, General Duty	075.378	31	31	31
27.	Order Filler	249.368	20	17	20
28.	Patrolman[a,b]	375.268	36	0	0
29.	Production Machine Operator	609.885	10	9	10
30.	Programmer, Business	020.188	18	18	18
31.	Psychologist[b]	045.108	19	19	0

	Title	DOT Code	Number of Subjects OVIS	MIQ	MSQ
32.	Salesman, Life Insurance	250.258	17	17	17
33.	Salesman, Real Estate	250.358	7	6	6
34.	Secretary	201.368	25	26	25
35.	Shipping Clerk II	222.587	23	19	23
36.	Spinner, Frame	682.885	15	15	15
37.	Stock Clerk	223.387	24	22	24
38.	Teacher, Elementary	092.228	35	35	34
39.	Teller, Bank	212.368	23	20	24
40.	Tobacco Grower[a,b]	405.181	10	0	0
41.	Typist	203.558	24	23	24
42.	Wood Technologist	040.081	14	14	13
43.	Yarn Winder	681.885	20	15	20

[a]Job not included in the analyses for Hypothesis 2.

[b]Job not included in the analyses for Hypotheses 3 and 4.

APPENDIX C

LIST OF PARTICIPATING ORGANIZATIONS

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Administrative Computing Service
American Enka Company
A. M. Smyre Manufacturing Company
Athey Products Company
Bi-Rite Stores, Incorporated
Branch Bank and Trust Company
Carolina Power and Light Company
Carolinas Construction Training Council
Colonial Stores, Incorporated
Cornell Dublier Electronics
C. P. Clare and Company
City of Raleigh
Cone Mills Corporation
Corning Glass Works
Dickenson Elementary School
Dorothea Dix Hospital
Duke University Medical Center
First Citizens Bank and Trust Company
Halifax County Agricultural Extension Service
Jefferson Standard Life Insurance Company--Greensboro Agency
Mid-Atlantic Circulation Managers Association
Nash County Agricultural Extension Service
National Association of Theater Managers--Carolinas Division
National Register Records Center
North Carolina Department of Corrections
North Carolina Department of Motor Vehicles
North Carolina Department of Revenue
North Carolina Highway Commission
North Carolina Library
North Carolina Motel Association
North Carolina State Highway Patrol
North Carolina State University Business Office
North Carolina State University Computing Center

North Carolina State University Wood and Paper Science Department
North Carolina Wildlife Resources Commission
Occidental Life Insurance Company
Odell Hardware Company
Pilot Life Insurance Company
Pitt County Agricultural Extension Service
Sears, Roebuck and Company
Scovill Fluid Power Division
Sternberger Elementary School
Textiles, Incorporated
Triangle Universities Computing Center
Wake County Department of Social Services
Wake County Library
Wake County Schools
Western Electric

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